

are described the following new species of East Indian *Sargassa*, *Sargassum obovatum*, *S. Wightii* and *S. cervicorne*. Drawings and dissections were exhibited. The paper will appear in the 'Annals of Natural History' and in the Society's Transactions.

5. "An Account of the Mosses and Hepaticæ growing on the Pyrenees," by Richard Spruce, Esq. (See p. 81 of the present Number.)

#### MISCELLANEOUS.

*On the Existence of an Ovum or Ovule as well in the Male as in the Female of Plants and Animals; producing in the one case Spermatozoa or Pollen-grains, in the other the primitive Cells of the Embryo.*

By CH. ROBIN, M.D.\*

THE above-named memoir was submitted to a commission, consisting of MM. Serres, Dumas, and Milne-Edwards, and the following report has been drawn up and printed in the 'Comptes Rendus':

"The facts contained in this memoir prove that, in the male organs of plants and of animals, an ovule is formed, analogous to that of the female, and constituted in a like manner; that the vitellus of this ovule divides as does that of the female, and by the same mechanism, giving rise to the development of the embryonary cells, which after being modified by a special evolution constitute pollen-grains or spermatozoa. Thus there is an analogy, and often an identity, between the product of the male generative organs and that of the female. On the other hand, there is an identity in the mode of formation of the embryonary cells in the ovum of vegetables and of animals; and lastly, the mechanism by which the embryonary cells of the male ovule (which are modified to constitute pollen-grains or spermatozoa) are formed, is the same as that which gives birth to the primary cells of the female ovum, the collection of which forms the embryo. Thus the phænomenon of the division of the vitellus, figured and described for the first time among the Vertebrata by Prévost and Dumas, may be extended to vegetables in an equal degree, and it is the expression of a general and unique mechanism, according to which the embryonary cells and zoosperms of all beings are formed.

"A. *Analogy in the mode of formation of the embryonary cells in the ovules of animals and of vegetables.*

"1. It has been for a long time admitted that the ovum of animals appears among the cells of the Graafian vesicles, or the bottom of the ovigerous tubes of the ovary, in the form of a small translucent cell, the nucleus of which is represented by the germinal vesicle. By degrees the transparent contents of the cell become granular and opaque, and constitute the vitellus. At this moment the ovum is fitted for fecundation: it is still but a cell in a morphological point of view; physiologically speaking, however, it has a special nature,—it is a product without an analogue in the body, and set apart for a special function. On the occurrence of fecundation it becomes subject to division, leading to the formation of embryonary cells at the ex-

\* The editors are indebted for this communication to J. T. Arlidge, F.R.C.S.L.

pense of the vitellus, within its homogeneous and amorphous envelope—the vitelline membrane.

“2. Referring to cryptogamic plants, nothing is more striking than the identity between the segmentation of the contents of the spores for the development of sporules, or the division of the contents of the latter for the formation of embryonary cells and the like phænomenon in animals (see the works of Thuret and Decaisne). Moreover, one cannot hesitate to compare the spores or the sporules of cryptogamic plants with the ovule of animals,—their homogeneous envelope with the vitelline membrane, and their granular contents with the vitellus. With respect to the differences which, in this point of view, exist between the formation of spores and their germination among fungi and microscopical algæ, they constitute no more than mere varieties of the phænomenon of segmentation, and such are to be met with in higher organizations, and the gradual simplification or degradation may be traced.

“3. In phanerogamous plants the embryonary sac appears in the form of a transparent cell in the nucleus of the ovule: its contents very soon become granular and form a true vitellus. After fecundation two nuclei make their appearance, around which the granular matter of the vitellus collects itself; in the line of separation between these two spherical bodies a dissepiment appears, indicating the formation of the membrane to envelope each of them and to transform them into embryonary cells: this effected, each of the latter subdivide into two, and so on. Here it is still evident that the embryonary cells are formed after the same fashion as in animals, and these facts show that the embryonary sac of phanerogamous plants is the only part of them comparable with the ovum of animals. We have in it the true ovule of plants, in the form of a cell, soon displaying a homogeneous envelope or vitelline membrane, and a granular interior or vitellus. As to the primine, secundine, and nucleus or tercine, these are but organs composed of cellular tissue, organs of protection or of nutrition, and accessory only to the essential part—the ovule.

“B. *Analogy between the product of the male organs and that of the ovaries of the female among plants and animals, and identity between the mode of formation in the male ovule of the grains of pollen or of spermatozoa, and that of the embryonary cells in the female ovule.*

“1. All botanists agree in describing, in each half of the young anther, the development of large cells, out of which the grains of pollen are formed, and which are called the parent-cells of pollen, or pollen-utricles. These utricles are made up of granular contents, constituting a true vitellus analogous to that of the vegetable ovule, and inclosed by a homogeneous wall, or vitelline membrane. In the vitellus, at first two, and afterwards four nuclei appear, around which the vitelline granules congregate, in such a way as to form so many small spheres, each of which soon becomes furnished with an inclosing envelope. These cells thus formed, after some modification of their walls, constitute grains of pollen. The analogy in the formation of the latter to that of the embryonary cells in the ovule, or embryonary sac of the plant, cannot fail to be observed, in



every point, except in that the embryonic cell of the male ovule whilst retaining its cell-form, has become a special organ, endowed with a special property, viz. fecundation by the intromission of the pollen-tube into the ovule: whilst in the female ovule, on the contrary, the embryonary cells analogous to those of the male ovule are metamorphosed into anatomical elements (tracheæ, dotted vessels, cellular tissue, &c.).”

The reporters go on to observe:—“2. That the facts contained in this part of the (M. Robin’s) memoir demonstrate that, in cryptogamic plants, the antheridia must be regarded as the analogues of the male ovules of vegetables: they are formed, in fact, of a homogeneous envelope,—the vitelline membrane, and contain a granular mass,—the vitellus. At the expense of this vitellus are formed the moveable animalcules of algæ, mosses, &c., the true spermatozoa of algæ, as believed by MM. Thuret, Decaisne, and Montagne, &c. The observations of M. Robin tend also to show, that the spermatozoa of many algæ have sometimes been confounded with spores provided with vibratile cilia, or zoospores; and he describes, after some original observations, the development of those of *Ulva lactuca*. He states that in this plant the granular contents, or vitellus of the cells of the frond,—which fulfil the office of antheridia, or of the male ovule, become broken up into two, four, or eight, or into as many as twelve, twenty-four, and even thirty-two segments, or little spheres, after the same plan as prevails in the division to form pollen grains, or vegetable, or animal embryonic cells. Very soon four cilia are developed on one point of the surface of these spherules, and then the latter escape from the ruptured antheridium, evincing very active movements. With respect to cryptogamic plants, the male fecundating corpuscles of which are as yet undiscovered, further researches are necessary.

“3. M. Reichert has watched the development of the spermatozoa in the *Strongylus auricularis*, and in the *Ascaris acuminata*. In the first stage, some transparent cells spring up at the bottom of the testicular tubes, each provided with a germinal vesicle, the contents of which soon become granular, and assimilate it to the vitellus of the female ovum; whilst the envelope appears homogeneous and amorphous, like the vitelline membrane: in short, it is a true ovule, similar in every respect to one of known female origin. The vitellus very soon divides into two spheres, then into four, each of which gets inclosed by a wall, and constitutes an embryonic cell: by degrees each cell thus produced changes its form, and at the same time a prolongation makes its appearance at one of its poles, which forms the tail of the spermatozoon, the cell itself forming the head or body. M. Ségond has, in conjunction with M. Robin, also noted this identity of the male and female ovule in the blue Rhizostoma (*Rhizostoma Cuvieri*), as well as some of the phænomena of the evolution of the vitellus.

“Résumé.—1. It is seen that an ovule is formed in the male organs analogous to that derived from the ovary; that in the male ovule grains of pollen or zoosperms are developed, after the same manner as the primitive cells of the embryo are formed in the female ovule, and hence these fecundating corpuscles are the analogues of the em-

bryonary cells, with this constant difference, that they are themselves spontaneously formed, and become the determining cause of the evolution of the latter.

“ 2. As to the development of the tail, or the vibratile cilia of the spermatozoa of algæ and of animals, and the movements they present, these are not more astonishing than the formation of vibratile cilia on the surface of epithelial cells of mucous membrane, and both are, without doubt, of the same, and as yet unknown, nature. But the movements they exhibit are not of themselves sufficient to characterize spermatozoa as animals, no more than the carrying about of an epithelial cell, or of a spore of fucus by the agency of cilia can constitute either of those an animal; in fine, they are no more animals than are embryonic cells.

“ 3. It being once recognised that an ovule is formed by the male apparatus analogous to that produced by the female, and presenting an identity with the latter in its evolution, two series of ovules may be naturally formed:—

“ A.—Of male ovules.

“ 1. Those of animals (parent zoospermic utricles).

“ 2. Those of cryptogamic plants (antheridia, or cells fulfilling their purpose in the *Ulvaceæ* and other cryptogamia).

“ 3. Those of phanerogamous plants (parent-cells of pollen).

“ B.—Of female ovules, or ovules strictly so called.

“ 1. Those of animals (ova).

“ 2. Those of cryptogamic plants (spores, some zoospores, sporules).

“ 3. Those of phanerogamic plants (vegetable embryonary sac).

“ All ovules or ova are constituted essentially of a vitellus with its germinal vesicle and vitelline membrane. But in the male ovules the division of the vitellus is a primitive phenomenon, spontaneous, and always limited to the formation of spermatozoa—the true embryonary cells of the male, which have the property of determining in the female ovule the same phenomenon (self-division) which has given them birth, and which proceeds in the latter to the evolution of the embryo. The female ovules, on the contrary, form the second series of organs, the vitellus of which, in order to become divided in its turn, and to form the primary cells of the embryo, needs the concurrence of the spontaneously developed products of the male vitellus.”—*Comptes Rendus*.

### *On the Gum Kino of the Tenasserim Provinces.*

By the Rev. F. MASON.

In a valuable article by Dr. Royle on Gum Kino, reprinted in the Journal of the Agricultural and Horticultural Society of India, which ostensibly enumerates all the various regions from which it has been imported into England, there is no mention of this article being imported from this coast. Yet long before Dr. Royle compiled that communication, more than one consignment had been made by parties in Maulmain to houses in London of gum kino to the amount of a thousand pounds.

It was brought to Maulmain by an English merchant from the